Appl. No. 10/032,156
Amdt. dated December 8, 2004
Reply to Office Action of August 23, 2004

PATENT

REMARKS/ARGUMENTS

Claims 1-53 were pending. In this amendment, no claims are canceled and claims 9, 18, 19, 23, 24, 27, 31, 34, 36, and 45 are amended. Thus, following this amendment, claims 1-53 will remain pending.

An interview with the Examiner was had with the undersigned on November 29, 2004. The matters discussed included background on Reed-Solomon codes, convolutional codes and block codes, including how various codes have a defined code rate determined from the number of information bits input to a coder and the number of bits representing the output symbols, such as RS codewords, as well as a discussion of what the Wolf reference discloses and the claims of the present invention generally. No agreement was reached.

In the Office Action, the Examiner objected to claims 9-14, 18-25, 27-49 and 51-53 under 35 USC §112, ¶2 as being indefinite. These objections appear to relate to language in claims 9, 18, 23, 24, 27, 31, 34, 36 and 45 that has been changed in this amendment. As for the amendment to claim 23, the phrase "substantially concurrently" is replaced with "as needed" and the latter phrase is supported by the originally filed application. See, for example, paragraph 49 thereof. Applicant submits that each of the Examiner's objections has been addressed by amendments.

Claims 1-7, 15-17, 26-30, 32 and 50 were rejected over cited references. In particular, claims 1-3, 6-7, 26-27, 30, 32 and 50 were rejected under 35 USC §102(b) as being anticipated by Wolf (U.S. Patent 5,983,383), claims 4-5, 15-17, 28-29 were rejected under 35 USC §103(a) as being unpatentable over Wolf, and claims 8 and 33 were rejected under 35 USC §103(a) as being unpatentable over Wolf in view of Dillon et al. (U.S. Patent 6,430,233). For least the reasons stated below, Applicant respectfully requests reconsideration and withdrawal of the §§102/103 rejections.

Of the rejected claims, claims 1, 27 and 50 are amended, to clarify the claimed subject matter and to address informality objections.

Claim 1 is allowable over the cited references as those references, alone or in combination, fail to disclose or suggest each element of claim 1. For example, claim 1 recites

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"generating a plurality of output symbols from a combined set of symbols...wherein the number of valid output symbols for a given set of input symbols is more than an order of magnitude larger than the number of input symbols". This element was argued in a previous response and the current Office Action responds to that argument. The prior arguments need not be repeated here.

The Examiner concedes that a code rate of less than 1/10 may be impractical. Applicant submits that it does not follow that if N>1 in a Wolf encoder, the number of valid output symbols for a given set of input symbols would be more than an order of magnitude larger than the number of input symbols. It is important to note the claim language "given set of input symbols". The Examiner's argument seems to be that if an input symbol is X bits and an output symbol is X*N bits, then there are $X^{(N-1)}$ times more output symbols. However, that is not what is claimed.

Applicant concedes that 1) if an input is 10 bits that can take on any value, there are 2^{10} possible inputs, 2) if an output is 20 bits that can take on any value, there are 2^{20} possible outputs and 3) $2^{10} / 2^{20} = 2^{10}$, which is more than an order of magnitude difference (about three orders of magnitude). Even so, for any encoder that makes sense, the output cannot take on all 2^{20} possible values, as the output for any decoder that makes sense must be constrained and determined from the inputs.

In a simple example, consider a coderate 1/3 convolutional coder with input symbols being four-bit symbols (and then necessarily the output being 12 bits). The coder can take in any one of sixteen bit patterns and outputs 12 bits in response. While there are 4096 ways to arrange "0"'s and "1"'s in 12 positions, it is clear that for a given four-bit input, not all of those 4096 choices are valid. If they were, there would be no way to determine what the input was. In fact, for most deterministic coders, there is exactly one 12-bit pattern that is a valid output of the coder for a given four-bit input. In that case, the number of "valid output symbols" (12 bits) for "a given set of input symbols" (four bits) is exactly three. It is most definitely not 4096/16=256 as the Examiner suggests.

In view of the above, Applicant submits that Wolf does not in fact disclose or suggest the recited element of claim 1 of "generating a plurality of output symbols from a

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combined set of symbols...wherein the number of valid output symbols for a given set of input symbols is more than an order of magnitude larger than the number of input symbols". Wolf discloses several examples of Reed-Solomon encoders and convolutional coders. For example, Wolf describes a (7,3) Reed-Solomon code over GF(8). An encoder for that code would input three symbols and output seven symbols and the particular values for the seven symbols are determined by the code's generator polynomial. In another example shown in Wolf, a 1/2, K=3 convolutional encoder codes an input bit stream into an output bitstream wherein the output bits are twice as numerous as the input bits. The particular output bits that result are determined by the input sequence and there are only twice as many valid output bits for a given set of input bits. Thus, none of the examples in Wolf show the number of valid output symbols for a given set of input symbols being more than an order of magnitude larger than the number of input symbols.

Even as the Examiner admits, where a convolutional encoder has a coderate of 1/N and receives an input of 14 bits, it will only output 14xN bits. Nowhere does Wolf indicate that its encoders would output the Examiner's suggested 2^{28} output bits for an input of 14 bits or even for an input of 2^{14} bits. Applicant submits that the Examiner has not shown how an encoder disclosed or suggested in Wolf could generate, from a set of input symbols, more than a magnitude more valid output symbols.

Therefore, claim 1 is allowable over Wolf. Applicant submits that as the rejections of the remaining rejected claims should be withdrawn for at least the same reason that claim 1 is allowable.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

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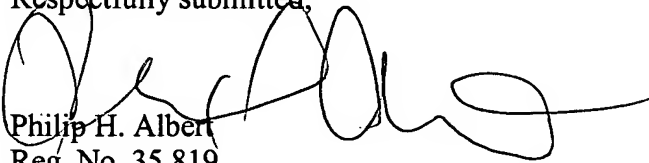Reply to Office Action of August 23, 2004

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If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

Dated: 12/17/04

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